

Titre
Title

Reengineering of Space Projects

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In an era of shrinking funds for space exploration, JPL is undergoing a significant reengineering effort designed to reduce costs of flight projects by 25 percent, and time to launch by 50 percent. It has been projected that the laboratories business base of 450 million annually for flight projects can be reduced by 115 million. It is expected that the new processes will be deployed by 1998.

Following the lead of Dr. Michael Hammer, co author of 'Reengineering the Corporation', JPL under Dr. Ed Stone is transforming a vertical organization into an agile, flat organization of coordinated engineering processes. It is the design of these concurrent processes, with an integrated set of new tools, that enable the savings projected above.

The paper describes the four major processes being used at the laboratory and their relationships to each other. The focus of the technical material is on the design and specifications aspects of new projects. It describes how new design tools can be integrated for space applications to reduce the design cycle time, and link a verified design to an automated manufacturing process, (the latter is not discussed in this paper). Most of these new tools are commercial off the shelf (COTS) tools, so no new developments are required, only new ways of utilizing the information to promote high concurrency .

The new tools are featured for a new process that eliminates the need for the traditional serial requirements process. Substituting for the levels of requirements is a modeling capability providing an executable specification, i.e., a functional specification that can be executed over time to describe all of the states of an interface, not just a worst case . These 'systems models' prevent over design for missions requiring tight margins, as most of the NASA's future mission set does. The models also relate to a requirements tool to capture the design. A model based systems requirements is more agile and versatile with regard to proposed changes. Requirement changes evaluations with regard to risk and cost implications are now easy, and do not impede progress.

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This model set, representing the systems requirements, is related to a subsystem design process that can be directly linked to hardware and software automatic manufacturing. Subsystem models are loosely based on the behavior models now being used in the commercial electronics industry. The behavior models of the subsystems are compiled on 68000 micro processor, single board computers to produce an early simulations capability. This simulation is exercised with a typical flight scenario, and the results compared to the systems models. The overall system is processed based, so after validation, manufacturing assembly, and test can take place in an automated fashion.

Finally, the paper concludes a description of the engineering pilots ongoing at JPL. Each pilot was selected to develop the modeling capabilities of each of the four processes, and to shake out the new engineering approach. Immediate results have already been realized by employing these techniques to studies.